1936

Riddle-Solving Ability and Intelligence

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RIDDLE-SOLVING ABILITY AND INTELLIGENCE

BY

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A Thesis Submitted in Partial Fulfilment

of the Requirements for the Degree of

Master of Arts

in

Loyola University

1936

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CHAPTER I

STATEMENT OF THE PROBLEM

A frequent point for argumentation among students of education as well as among people in general is one involving the question of intelligence being connected with riddle-solving ability. Are persons of higher intelligence better at solving riddles than those not so well equipped mentally? To answer this question this study has been undertaken in the belief that it may determine whether or not there is any correlation between what is called school intelligence in children and their ability to solve simple riddles.

It may be well at the outset to indicate in brief form a number of particulars in which this investigation has endeavored to insure safe and sure results. It has aimed at certainty and value in the following ways in particular:

1. There was no changing of experimenters during any series, all the tests in a series being given by the same experimenter.
2. The rooms in which the tests were given were kept as free as possible of all sources of distraction.
3. Every test was given to all students in precisely the same manner, down even to the directions for working the test.
4. An attempt was made to stimulate interest and a

desire to have the greatest number possible of correct answers by telling the pupils beforehand that the same set of riddles was being given to children of the same age in other classes and schools, thus creating the competitive idea.

5. The tests given were all new, never before having been used in this way.

Riddles seem to provide a relatively unknown but very promising means of studying certain phases of the human intelligence. This investigation has been pursued in the belief that it may lead to scientific and fundamentally valuable results.

CHAPTER II

NATURE OF INTELLIGENCE

MISCONCEPTIONS

Great disagreement exists as to what intelligence is. To discuss intelligence and please all students in the field of education would be a virtual impossibility. Before giving a general consideration of the nature of intelligence, it may be well here to consider a few apparent misconceptions which have been held at various times by various groups of people. A common opinion held by some is that intelligence is some kind of power or force which is acting in the individual and influencing his actions. Boynton (5) believes that "to think of intelligence itself, however, as a definite force or internal power is to give it wholly inexplicable qualities, entirely unnecessary in the explanation of the phenomena of intelligent reactions." Intelligence undoubtedly involves a capacity for action but it is not a self-starting factor which originates action nor is it action itself.

Another common misconception one encounters in the field of intelligence is that intelligence is something which can be added to in the life of any individual. Many believe that all that is necessary to make any person an "intelligent person" (popular terminology) is simply to put around that person proper environmental influences. The classic example of this theory put into practice is that of Itard, who endeavored to bring to normalcy the "Wild Boy of Averyon," a foundling

in France. Under no condition could it be said that the experiment was successful.

Some educators, like Watson (30), go so far as to say that the status of any individual is simply the result of his training and environment. These men practically eliminate the entire hereditary influence. Bagley (1) also holds to the above conception of intelligence. It is most probable that these men have evolved certain theories of education which would be of little value if this theory of intelligence were to be discarded.

CONCEPTIONS

James (11) makes as the criterion of intelligence the ability to adjust oneself successfully to a relatively novel situation. Burt (6) defines intelligence as "the power of readjustment to relatively novel situations by organizing new psycho-physical combinations." Stern (23) calls it "a general capacity of an individual consciously to adjust his thinking to new acquirements - it is general mental adaptability to new problems and conditions of life." Binet, as quoted by Terman (24), describes it as

(1) the tendency of thought to take and maintain a definite direction

(2) the capacity to make adaptations for the purpose of attaining the desired end

(3) the power of self-criticism

Colvin (7) considers that intelligence can be summed up in terms of

behavior as capacity to learn. He defines it as "a group of innate capacities by virtue of which the individual is capable of learning in a greater or lesser degree in terms of the amount of these innate capacities with which he is endowed."

Thurstone (28) classifies intelligence into four types: trial and error, perceptual, ideational, and conceptual. This may be called a qualitative account of intelligence. Contrasted with it is the quantitative account, which is for the purpose of explaining differences in degree of intelligence among different individuals. In a descriptive account of intelligence for the purposes of mental tests we must not stop with a qualitative statement but must show how differences in degree of intelligence in different individuals may be explained. In a discussion of mental tests we are, of course, interested primarily in the quantitative analysis of intelligence, and descriptions or definitions are pertinent only insofar as they may throw light on individual differences.

The Scholastic philosophers (13) expound the theory that intelligence is the ability to form abstract ideas and to perceive ideas in an abstract way.

The above definitions are given by those handling problems of intelligence and they show a remarkable lack of similarity. One must come to the conclusion that each has within it something of value, at least, and some phases of intelligent behavior unquestionably include parts of each.

Boynton (5), although he suggests the possible criticisms to his theory on intelligence, gives the essentials and definitions which should, in his estimation, be included under intelligence:

(1) It must make of intelligence a capacity; and one must realize that, as a capacity, intelligence is part of the native endowment, is unaltered by environment, is not a motivating force or influence, and, from the biological point of view, is probably little more than capacity for neural response to organic needs.

(2) Intelligence cannot be adequately defined in terms of adjustment or adaptation alone but must incorporate the idea of reconstruction or reorganization. It must recognize the fact that environment is changed by the intelligent individual just as truly as is this individual changed by environment.

(3) The best available criterion which we have of intelligence is the behavior of the individual in his group and the fulfilling of group needs.

(4) It must be seen that intelligence rises with ability to foresee the ultimate needs of the group, to look beyond the temporary to the complete and larger needs.

With these four factors in mind Boynton (5) now defines intelligence as an "inherited capacity of the individual which is manifested through his ability to adapt to and reconstruct the factors of his environment in accordance with the most fundamental needs of himself and his group."

INTELLIGENCE: SPECIFIC OR GENERAL

The earlier students of mental tests who wished to measure general intellectual capacity sought for some single test that would measure a particular capacity. That is, some identified general intelligence with one of the particular mental functions and then again, some believed without a doubt that intelligence tests were designed in an effort to measure general ability. Binet and Simon had as their purpose the measurement of such things as judgment, comprehension, reasoning, and common sense, with apparently no idea in mind that these might be strong in one direction of an individual's activity and relatively weak in another phase of the individual's activity, or that the same individual might vary from one to another of these elements (4). During the last few years there are some psychologists who have emphasized the point that individuals possess special capacities or, in other words, have more intelligence in one line than in another (18).

Spearman (19) gives statistical evidence of the existence of some sort of general factor in mental tests which is responsible for the fact that the tests are intercorrelated with each other in a systematic

fashion, some having relatively low intercorrelation with other tests and others having relatively high intercorrelation. This general factor was originally called general intelligence. Spearman prefers to designate it by the symbol "G" since he thinks of it as a more abstract element of intelligence than is usually meant by the term intelligence itself.

The general factor alone cannot account for intellectual achievement and for mental test scores. To account for the fact that some intercorrelations are low, even approaching zero, Spearman assumes a host of particular factors, unrelated to the general factors and entirely independent of each other.

In Spearman's "two-factor theory" one's response to a test situation is determined by two factors, or sets of factors. One of these factors is common to all of the varied responses. This is general intelligence or "G". The other factor is specialized and varies from one test situation to another. Again, various test situations demand different degrees of general intelligence. In some responses this general factor is the more important; in others the special factor is the more important. Spearman also believes that whenever the mind turns from one operation to another, the energy is switched off from one engine to another, much as the power supply of a factory can be directed at one moment to the turning of a wheel, at the next to heating a furnace, and then to blowing a whistle (20).

Spearman has attempted to prove his theory by means of certain

mathematical techniques but these techniques or methods, when employed and interpreted by other investigators, have failed to point to the same conclusions in all instances as those given by Thorndike in his sharp criticism of Spearman's two-factor theory in 1913 (25). Thorndike called attention to the fact of positive correlation between desirable traits but rejected the hypothesis of a single common factor as being responsible for this correlation.

Thorndike (26) has suggested that intelligence is of three types:

(1) Mechanical - This type refers to an ability to understand and manipulate things and machines.

(2) Social - An ability to understand and manage people.

(3) Abstract - An ability to understand and use ideas and symbols.

More recently, Thorndike (27) has taken another division of "intellect" where he postulates the existence of "attitude," "extent," and "quickness." In this light, his theories are quite suggestive of Spearman's G and he has approached the proof of this last theory much more seriously, thoroughly, and scientifically than he did with the first.

Again concerning ourselves with Spearman's two-factor theory, it would appear that an indisputable and unequivocal proof has yet to be formulated for the theory, although, as Pintner (16) says, "It does not follow, of course, that Spearman's theory falls, even if his method of proof is not valid."

From a logical point of view the theory is at once fascinating, interesting, suggestive, and charged with many possibilities, and from a scientific point of view it has yet to be demonstrated to the complete satisfaction of all investigators (5).

The issue between the Spearman and Thorndike schools of thought as to whether intelligence is a unitary factor or has a unitary factor underlying it lies, perhaps, still in the field of debate. Freeman (9) believes that the statistical evidence, so far as it goes, favors the notion that intelligence rests upon some more or less unitary factor, although Kelley (12) believes that the essential traits of mental life are untenable.

THE MEASUREMENT OF INTELLIGENCE

Although considerable confusion exists concerning the meaning of intelligence, it is desirable that a definite and rigid definition of intelligence should precede all attempts at measurement. The term is derived from the Latin word "intelligere," which is composed of "intus" and "legere," meaning to read within a thing the very reason for its being. Intelligence is obviously akin to intellect, which is derived from the perfect passive participle of "intelligere," whereas intelligence is derived from the present active participle. As these sources indicate, the intellect means man's cognitive capacity or power, while intelligence means the actual exercise of the intellect (3). Hence, intelligence must be defined in terms of essential intellectual activities, particularly comprehension, judgment, and reasoning. Since

intelligence means the exercise of cognitive capacity, the measurement of an individual's intelligence means to determine quantitatively the extent to which he is able to grasp, to understand, to judge, and to reason about realities that fall either directly or indirectly within his environment (13).

The present measures of intelligence are examinations of general intelligence. That is, they are tests of operations of the intellect rather than of information.

William A. Kelly (13) believes that intelligence tests are based upon certain assumptions, namely:

(1) That what has been learned is an index of what can be learned.

(2) That the training factor is constant; that is, that the training or experiences in the activities which constitute the test have been equal or as nearly so as possible for all.

(3) That a typical functioning of a given ability can be secured for the purpose of testing.

(4) That testing conditions can be controlled not only throughout a single testing period but also on subsequent occasion and by different examiners. These conditions include the explanation of the test, the time element, the attitude of the pupil, the effort which the pupil makes, and all factors which affect the performance of the child.

A worthwhile intelligence test should include the following characteristics: validity, reliability, and standardization, validity being the truthfulness of the test, reliability referring to the accuracy with which the test measures whatever it does measure, and standardization being the setting-up of suitable objectives, goals, and aims for the procedure, for the method of scoring, and for the method of recording responses.

In order to make an individual's score on an intelligence test meaningful, all measures of general intelligence have been standardized in terms of mental age. Mental age expresses the individual's general ability as measured by the test at the time it was given in comparison with average children of different ages. For example, a particular child whose achievement on the test is equivalent to that of the average ten-year-old has the general mental ability of a ten-year-old child regardless of what his actual chronological age may be. Therefore, a certain mental age means that the individual can get about the same score in a test that the average person of that age can get.

Intelligence testing has become a recognized feature in educational procedure. Although intelligence testing has many uses in school affairs, some enthusiastic educators are accustomed to claim for the intelligence tests values which cannot be substantiated. There are limitations to these tests, in that intelligence tests must not be considered to be the final measure of an individual's intellectual capacity.

As to the educational significance of the measurement of intelli-

gence, one must come to the conclusion that the greatest contribution which could be made by psychology to education would be the means for complete and accurate measurement of intellectual capacity. The present-day intelligence tests are steps toward the accomplishment of this ideal.

Brother Lewis Richard Steinbrink (22) describes the educational significance of intelligence tests in a most complete and satisfactory manner, as follows:

> "The function of education with regard to man's life work is threefold: it must unfold life's meaning and purpose before our eyes; it must discover the hidden potentialities of our being in relation to this meaning and purpose; it must guide the actualization of these potentialities and direct them into their proper sphere. It would not be untrue to say that such functions demand of the educator more wisdom than mere mortal man possesses. If that be so, what excuse shall we have if we fail to make use of every instrumentality that genius has devised for the purpose of assisting in this task of tasks entrusted to us? If psychology has meaning and worth in any profession it is and should preëminently be in that of the educator. Now if the teacher had Solomon's option to choose a single gift within the power of psychology to bestow, what better choice could he have made than that of a practical instrument that would be of help in gaining an insight into the mental capacities whose actualization he proposes to help and direct? The mental test is meant to be just such an instrument. What of its limitations and lack of ultimate perfection? Even the microscope distorts its object, limits our view, and depends upon the skill of the microscopist for reliable results."

CHAPTER III

THE RIDDLE

HISTORY

The origin of the riddle is not known, but it has been and is now found quite generally even among peoples of a low degree of mental advancement. To quote Rolland: "From the Vedic riddles to the riddle contests of Scandinavian gods, or of German minnesingers, from the famous question of the Sphinx to the 'Philosophies des Enignes' of Menestrier, . . . from the riddle that caused the death of Homer to those which amused all the Wolofs, - we find great variety, wide contrasts, but nevertheless a fundamental resemblance."

Riddles play upon analogies among things perceived. Essentially, the primitive mode of invention is as follows: Someone discovers a new analogy among the natural objects, formulates a question concerning it, and thus a new riddle is born. While the most primitive forms have chief reference to natural objects, the evolution of the riddle reflects the shifting of man's chief interest from external nature to man himself. Some of the most famous riddles among the Greeks have this human focus.

Just when in the development of a people riddle-making begins, and also the period when it loses its soberer aspect and becomes a mere sport or pastime are not easily determined. They bear obvious relation to intellectual status. Tylor thinks that the simpler forms,

the "sense-riddles," belong thoroughly to the mythologic stage of thought, and are in consequence found at home among the upper savages and range on into lower and middle civilizations (29). "The making of riddles," says he, "requires a fair power of ideal comparison, and knowledge must have made considerable advance before the process could become so familiar as to fall from earnest into sport. In higher states of culture riddles begin to be looked upon as trifling. They survive only as the remnants of child's play." (29) The role of the riddle in education among lower races must be important. Among the Basutos "riddles are a recognized part of education and are set like exercises to a whole company of puzzled children." (29) Even among people of higher culture the ability to answer riddles was considered a proof of great sagacity (14). The ability to interpret some of the replies of the Greek oracles was a supreme test of wisdom (15). Among Semitic peoples the same criterion existed.

DEFINITION

Analysis of the riddle shows it to contain some of the chief elements of literature. The anthropomorphizing and personalizing tendencies which often characterize it show the riddle to be closely related to the fable. And, having its deepest roots in the perception of analogies in nature, the riddle is brother to the metaphor, which has been so important in the development of languages and myths. A riddle may, indeed, be defined as a metaphor or group of metaphors, the usage of which has not yet become common and the explanation not evident.

It is a little difficult to define the word "riddle," especially to define it in such a way as to include all riddles worthy of the name without at the same time making the definition so very wide that there remain no descriptive features. One authority (8) defines a riddle "to imply a measure of wisdom which is in accordance with the early inclination to express truth in a mystical manner rather than in straightforward and simple speech. Thus Samson, in order to show his 'intelligence,' propounded a riddle to the Philistines."

A somewhat more inclusive definition is to the effect that a riddle is "a thing difficult to understand or solve - especially something purposely arranged so as to require time, patience, and ingenuity to arrive at the solution of its intricacies." (21) Lindley (14) defines a puzzle, which is in many respects very similar to a riddle, as "a problem which is apart from the usual experience of the given individual either in subject matter or method." Of these two items the relatively more important is method. Lindley further says, "Any problem which fulfils these conditions and which is tried chiefly for the sake of the reaction, and for the solution as such, may be a riddle or puzzle."

THE MENTAL FUNCTIONS TOUCHED BY RIDDLE TESTS

The riddle test is an admirable method of testing the ability to perform intellectual tasks because the riddle presents itself as a task apart from the usual experience of the given individual, the riddle being (a) a situation with a difficult and unknown solution, (b) a sit-

uation with an assuredly possible solution, and (c) a situation the factors for the solution of which are entirely in the control of the one seeking to solve the problem presented. The fact that a solution is possible has a certain stimulus effect upon the person endeavoring to solve the riddle. Knowing that the thing can certainly be done, he attacks the question in a confident and expectant frame of mind which would not be present if he doubted the possibility of an answer.

The riddle serves to provide a new situation, and there is no doubt that the appreciation and management of relations involved in riddle-solving is a very important feature of intellect, although it is hazardous and undesirable to assume completely that the perception and use of relations is all of intellect.

In using riddles for the study of children, there are the following advantages, not all of them, however, unique:

(1) The results of work on riddles are such that they lend themselves readily to exact record and tabulation.

(2) This particular field is largely unworked. Outside of the extensive research of Dr. Ruger (17), Mr. T. R. Garch (10), and Mr. John Hudson Ballard (2), there is nothing yet printed which makes elaborate or detailed scientific use of the riddle method for investigating the human mind.

(3) Riddles are sufficiently different from the

commonly accepted standards of intelligence, such as "book learning," to furnish a new and independent set of investigating standards (10).

(4) Riddles lie very largely outside the realm of daily or common experience, and their use is thus almost entirely free from the irrelevant factor of previous practice or familiarity.

CHAPTER IV

THE EXPERIMENT

The thirty riddles used for the final experiment were carefully chosen from a list of one hundred riddles given to one hundred pupils in order to test the difficulty and range of the riddles. These thirty riddles were selected because of their seeming fairness as mental problems. Also, those riddles which were capable of only one answer seemed best for the purpose in hand. However, thirty such could not be found and so, besides the most desirable, a few others almost as good were selected to make up the proper number. Thirty was the number fixed upon because this seemed to provide a generous scope and assortment of riddles.

After such search one concludes that really good and fair riddles are rare and that riddle solution today and in recent years cannot be a serious occupation, but must be more in the nature of a diversion, with the odds in favor of the propounder of the riddles.

The test administered to the subjects is reproduced in the Appendix.

SUBJECTS

The subjects of this experiment were six hundred (600) boys and girls of the Chicago public schools. They were distributed as follows:

	Boys	Girls	Total
Seventh grade	35	65	100
Eighth grade	52	48	100
Ninth grade	35	65	100
Tenth grade	72	28	100
Eleventh grade	58	42	100
Twelfth grade	74	26	100
Total	326	274	600

The children who participated in this experiment came from various sections of Chicago. The distribution is as follows:

	Burnside Elementary		Fenger High		Lane Tech. High	Kelly High		Manley High		Total
	B.	G.	B.	G.	B.	B.	G.	B.	G.	
Seventh grade	35	65								100
Eighth grade	52	48								100
Ninth grade			10	25	5	5	20	15	20	100
Tenth grade			15	5	20	25	10	12	13	100
Eleventh grade			15	15	20	15	14	8	13	100
Twelfth grade			20	8	15	20	10	19	8	100
Total	87	113	60	53	60	65	54	54	54	600

These pupils took the riddle test at various occasions during the period from October, 1932, to December, 1934.

The I. Q. data for each pupil was taken from intelligence tests given to the pupils at the beginning of the semester by reliable examiners. The I. Q. and M. A. were taken from these records inasmuch

as the tester was unable to assume the expense of 600 intelligence tests. The intelligence tests given were the Stanford revision of the Binet, the Thorndike Standard Group Examination of Intelligence, and the Otis Intelligence Test.

The mathematics grade for each student was carefully obtained from the teacher's mark on the boy's or girl's individual record sheet kept in the office of the principal in each school.

TABLE I

NUMBER OF RIDDLES SOLVED CORRECTLY

BY 600 PUPILS IN GRADES 7-12

Correct Solutions	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12	All Grades
25-30							
20-24					3	19	22
15-19			2	14	35	46	97
10-14	15	14	16	31	31	20	127
5-9	59	50	52	39	23	12	235
0-4	26	36	30	16	8	3	119
Mean	6.85	6.12	6.60	8.72	12.08	14.64	13.48

TABLE II

MENTAL AGES OF 600 PUPILS IN GRADES 7-12

M. A.	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12	All Grades
22-3 - 23-0						2	2
21-5 - 22-2						3	3
20-7 - 21-4					1	3	4
19-9 - 20-6				2	2	3	7
18-11- 19-8			1		4	5	10
18-1 - 18-10		1		6	5	7	19
17-3 - 18-0		1		2	5	3	11
16-5 - 17-2		2	2	12	5	14	35
15-7 - 16-4	3		16	16	16	25	76
14-9 - 15-6	5	6	16	16	30	29	102
13-11- 14-8	10	11	20	31	13	6	91
13-1 - 13-10	23	18	37	10	15		103
12-3 - 13-0	9	17	8	4	2		40
11-5 - 12-2	22	32			2		56
10-7 - 11-4	25	8		1			34
9-9 - 10-6	2	4					6
8-11- 9-8	1						1
Mean	12-5	14-5	14-6	16-1	15-8	17-8	15-9

TABLE III

CHRONOLOGICAL AGES OF 600 PUPILS IN GRADES 7-12

C. A.	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12	All Grades
18-11- 19-8					5		5
18-1 - 18-10					4	16	20
17-3 - 18-0			3	3	15	30	51
16-5 - 17-2		1	4	4	35	48	92
15-7 - 16-4	1	4	14	28	31	6	84
14-9 - 15-6	5	18	19	55	10		107
13-11- 14-8	11	17	44	10			82
13-1 - 13-10	22	23	10				55
12-3 - 13-0	43	29	6				78
11-5 - 12-2	16	6					22
10-7 - 11-4	2	2					4
Mean	12-11	13-9	14-9	16-5	16-8	16-5	15-2

TABLE IV

I. Q. OF 600 PUPILS IN GRADES 7-12

I. Q.	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12	All Grades
130-135						1	1
125-130				1			1
120-125				1	3	4	8
115-120		1		2		1	4
110-115	1	3	2	4	8	10	28
105-110	28	20	11	14	9	4	86
100-105			19	10	8	9	46
95-100	4	1	27	19	3	7	61
90-95	26	18	26	31	18	22	141
85-90	16	29	10	11	33	37	136
80-85	11	8	4	7	10	5	45
75-80	13	19	1		8		41
70-75	1	1					2
Mean	94.2	91.5	96.7	97.5	93.2	97.0	94.9

TABLE V

MATHEMATICS GRADES OF 600 PUPILS IN GRADES 7-12

Math. Grades	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12	All Grades
94.5 -104.5	28	26	9	5	4	6	78
84.5 - 94.5	19	24	46	23	39	44	195
74.5 - 84.5	44	16	42	67	42	43	254
64.5 - 74.5	5	20		3	8	2	38
54.5 - 64.5	4	14	3	2	7	5	35
Mean	85.7	82.3	85.3	82.1	82.0	84.1	83.5

TABLE VI

AVERAGE C. A., M. A., I. Q., MATHEMATICS GRADE, AND RIDDLE SCORE OF 600 PUPILS IN GRADES 7-12

	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12	All Grades
No. of Pupils	100	100	100	100	100	100	600
C. A.	12-11	13-9	14-9	16-5	16-8	16-5	15-2
M. A.	12-5	14-5	14-6	16-1	15-8	17-8	15-9
I. Q.	94.2	91.5	96.7	97.5	93.2	97.0	94.9
Math. Grade	85.7	82.3	85.3	82.1	82.0	84.1	83.5
Riddle Score	7	6	7	9	12	15	9.5

TABLE VII

CORRELATION TABLE SHOWING RELATION BETWEEN RIDDLE SCORE AND MENTAL AGE

N = 600

RIDDLE SCORE	MENTAL AGE																
	8-11-9-8	9-9-10-6	10-7-11-4	11-5-12-2	12-3-13-0	13-1-13-10	13-11-14-8	14-9-15-6	15-7-16-4	16-5-17-2	17-3-18-0	18-1-18-10	18-11-19-8	19-9-20-6	20-7-21-4	21-5-22-2	22-3-23-0
24															1	1	1
23									1								
22								2									
21								3	1				2				
20							2	2	2	2		2					
19						2		1				4	2				
18							2	7	10	2	2		3	1		2	
17							2	5	6	3		2					
16							2	1	1	2				1			
15						4	7	9	4	3	1	6					
14				2		1	2	4	2	4		1	3				
13						4	5	5	7	3							
12						5	3	4	6	1		1					
11					1	6	6	5	5	6	1	2			1		1
10				1	2	7	4	7	5	2	2						
9				1	2	9	14	6	3	2		1					
8			1	8	10	8	8	12	5		3			1			
7	1		1	5	4	16	4	4	4	1	2				2		
6		1	7	6	6	13	7	3	3	1							
5			7	10	3	10	7	7	2	1			2	2			
4		2	5	14	6	12	9	11	3	1							
3			4	2	3	5	3	1	1	1							
2		1	6	5	3		3	3	1								
1		1	1	2		1	1	2									
0		1	2					2									

$r = .545 \pm .007$

TABLE VIII

CORRELATION TABLE SHOWING RELATION BETWEEN RIDDLE SCORES AND CHRONOLOGICAL AGE

N = 600

RIDDLE SCORE	CHRONOLOGICAL AGE										
	10-7-11-4	11-5-12-2	12-3-13-0	13-1-13-10	13-11-14-8	14-9-15-6	15-7-16-4	16-5-17-2	17-3-18-0	18-1-18-10	18-11-19-8
24								2	1		
23										1	
22								2			
21								6			
20							4	5	1		
19							1	3	5		
18						1	3	5	12	6	2
17						5	5	4	2	2	
16						4		1		2	
15					2	4	7	14	3	3	1
14					1	4	7	5	2		
13				2	5	2	4	6	3		2
12			1		4	5	4	3	3		
11		2	6	3	4	9		4	6		
10		1	4	5	3	6	5	3	2	1	
9		3	6	4	3	8	3	8	3		
8		3	15	9	8	8	6	4	3		
7		4	13	3	12	7	2			3	
6		2	10	6	8	10	7	4			
5	3	3	8	6	12	8	8	3			
4		3	10	10	9	14	9	5	1	2	
3	1		1	4	7	1	2	3	1		
2		1	2	3	3	6	4		3		
1			2			5	1				
0				2	1			2			

$r = .408 \pm .022$

TABLE IX

CORRELATION TABLE SHOWING RELATION BETWEEN RIDDLE SCORES AND BOYS' M.A.

N = 326

RIDDLE SCORE	BOYS' MENTAL AGE															
	9-9 - 10-6	10-7 — 11-4	11-5 - 12-2	12-3 - 13-0	13-1 - 13-10	13-11 — 14-8	14-9 - 15-6	15-7 - 16-4	16-5 - 17-2	17-3 - 18-0	18-1 - 18-10	18-11 - 19-8	19-9 - 20-6	20-7 — 21-4	21-5 - 22-2	22-3 - 23-0
24														1	1	1
23								1								
22							2									
21							3	1				2				
20						2	2	2			2					
19					2								1			
18						1	4	7	2	2		1	2			
17						2	3		3							
16						2		1	1							
15					4	5	5	2	1		4					
14			2		1	1	1	1	1			2				
13				1	2	3	3	5	1							
12					3	5	2	5	1		1					
11					1	5	5	4	3		1					1
10			1	1	3	1	5	2	1	1					1	
9			1	3	2	7	2	2	2							
8			2	5	5	5	6	2					1			
7			3	2	8	2	1	2	1					2		
6		3	1	3	7	6	3	2	1							
5		2	3		5	4	4	2					2			
4		1	7	1	7	7	6	2								
3		1		1	2	2	1	1	2							
2		2	2	3	2	1	3	1								
1	1	1	1													
0							2									

$r = .458 \pm .003$

TABLE X

CORRELATION TABLE SHOWING RELATION BETWEEN RIDDLE SCORES AND GIRLS' M.A.

N=274

RIDDLE SCORE	GIRLS' MENTAL AGE																
	8-11-9-8	9-9-10-6	10-7-11-4	11-5-12-2	12-3-13-0	13-1-13-10	13-11-14-8	14-9-15-6	15-7-16-4	16-5-17-2	17-3-18-0	18-1-18-10	18-11-19-8	19-9-20-6	20-7-21-4	21-5-22-2
20										2						
19								1			4					
18							1	4	3				1			2
17								2	6			2				
16								1		1				1		
15							2	4	2	2	1	2				
14							1	4	1	3		1	1			
13						2	1	2	2	2						
12						3			1							
11						6	1		1	3	1	1				
10					1	4	4		3	1	1		1			
9				1		6	8	3	1			1				
8				7	4	2	3	6	2		3					
7	1		1	2	2	9	1	3	2		2					
6		1	4	5	3	5	2		1							
5			3	8	3	5	4	3		1			2			
4		2	4	4	8	4	2	4	1	1						
3			3	2	2	4	1									
2		1	4	3												
1				1		1	1	2								
0		1	2													

$r = .629 \pm .036$

TABLE XI

CORRELATION TABLE SHOWING RELATION BETWEEN RIDDLE SCORES AND MATHEMATICS GRADES

N = 600

RIDDLE SCORES	MATHEMATICS GRADES				
	54.5-64.5	64.5-74.5	74.5-84.5	84.5-94.5	94.5-104.5
24				3	
23				1	
22			1	1	
21			4	2	
20			4	6	
19			2	7	
18	2		10	14	3
17	1	2	6	7	2
16			6	1	
15		3	16	13	2
14	2		10	7	
13		2	8	10	4
12		1	9	8	2
11	1	1	23	5	4
10		2	17	7	4
9	1	1	11	18	7
8	4	5	24	15	8
7	2	3	20	12	7
6	3	1	20	13	10
5	1	4	17	18	11
4	6	10	23	14	10
3	3		10	6	1
2	5	3	7	5	2
1			6	1	1
0	4			1	

$r = .100 \pm .026$

TABLE XII

CORRELATION TABLE SHOWING RELATION BETWEEN RIDDLE SCORES AND I. Q.

N=600

Riddle Score	I. Q.												
	70-75	75-80	80-85	85-90	90-95	95-100	100-105	105-110	110-115	115-120	120-125	125-130	130-135
24										1	1		1
23				1									
22				2									
21				2	2			2					
20				6				4					
19		2		1				3	3				
18				15	3	3		2	4		2		
17				3	7	1	4	1	2				
16				2	2	1	1					1	
15		2		10	12	1	2	5	1	1			
14		2		2	5		4	4	2				
13			5	3	6	5	1	3	1				
12			3	9	7	1		3	2	1			
11				5	1	4	7	11	2		4		
10			6	1	8	3	1	7	3	1			
9		2	1	10	2	6	6	10	1				
8		1	5	6	19	6	5	14					
7	2			2	12	6	6	12	4				
6		3	3	14	19	5	1	1	1				
5		4	4	17	10	8	4	3					
4		6	10	19	14	8	3	3					
3		4	2	3	7	3	1						
2		9	5	5	3								
1		3	1	2	2								
0		3		2									

$r = .206 \pm .025$

TABLE XIII

CORRELATION COEFFICIENTS BETWEEN SCORES IN RIDDLE-SOLVING AND M.A., C.A., I.Q., MATHEMATICS GRADE, BOYS' M.A., AND GIRLS' M.A.

	GRADE 7	GRADE 8	GRADE 9	GRADE 10	GRADE 11	GRADE 12	ALL GRADES
M.A.	.640±.038	.663±.037	.314±.057	.240±.063	.168±.065	−.057±.066	.545±.007
C.A.	−.029±.067	−.154±.060	−.116±.066	−.230±.063	.082±.066	−.133±.066	.408±.022
I.Q.	.573±.045	.731±.031	.369±.058	.145±.065	.128±.066	−.174±.064	.206±.025
MATHEMATICS GRADE	−.015±.067	.131±.066	.096±.066	.233±.063	.153±.065	.218±.064	.100±.026
BOYS' M.A.	.567±.114	.495±.104	−.128±.166	.141±.076	.011±.715	.190±.075	.458±.003
GIRLS' M.A.	.653±.047	.133±.095	.280±.009	−.082±.103	.098±.102	.126±.102	.629±.036

CHAPTER V

ANALYSIS OF RIDDLES

THE VALIDITY OF RIDDLES AS MEASURES OF INTELLIGENCE

In using riddles to measure intelligence, the assumption has been that the qualities existing in the riddles themselves are fairly similar to the functions existing in tests of intelligence, and that in the act of solving the riddles there is present an increasing power for inference or reasoning, a keener perception and use of relations, and a greater ability to manage novel or original tasks.

It can be seen from the data that the correlation between riddle score and mental age is of a value considered by statisticians to be low and, if interpreted correctly, must indicate that there is little relationship between ability to solve riddles and mental age.

Although the above is indicated, e. g., that in the solving of riddles intellect is scarcely involved, one cannot overlook the doctrine that a person's intellect is measured by his ability to respond well to new situations, to do "originals." However, in view of the great difficulty of deciding just what situations are "new" for any given individual, the fact that "to respond well" is likely to bring in many vague general valuations again, and that our most approved present instruments include many tasks which seem as fittingly called responses to the familiar as to the new, one cannot depend too greatly on the

supposition that the ability to respond well to new situations applies too strongly in riddle solution as an aid in the testing of intelligence.

From the low correlation value it seems to follow that the chief defect in this method of testing intellect, which is measured by the percentages of the group that succeed, is that intellectual tasks alone are not involved. Any such task as solving a riddle may be deficient by not involving all of intellect and involve other factors than intellect.

In fact, no one short task does or can involve all of intellect and nothing but intellect. Any one short task such as the riddle test may measure only a fraction of intellect and is influenced by other forces than intellect. That is, any one short task such as the riddle test measures intellect plus an error. The nature and amount of this error must be considered in connection with any procedure for estimating the intellectual difficulty of a task from the percentage of individuals who succeed with it.

The ability to solve riddles not only depends on part of intellect but also upon previous training, industry, and interest. The low correlation value in this experiment may be ascribed either to the fact that the ability to solve riddles and mental age are of a somewhat different character or that they demand somewhat different abilities.

A PSYCHOLOGICAL ANALYSIS OF RIDDLES

In analyzing the riddles used in this experiment, one can see that few of them may be classified as easy, for there are very few which

were solved correctly by fifty per cent of the children.

In attempting to solve the first riddle, which asks what part of a fish weighs the most, the pupil must attempt to analyze each word and try to perceive any trick that may be needed in answering the question. The student in asking himself the question must consider the words "weighs the most" in two senses. One assumption has to do with what part of the fish weighs the most and the other, emphasizing the word "weighs," calls to mind the instrument used in weighing, namely, a scale. There is an immediate association of ideas here and the pupil perceives the trick in this riddle, the part of the fish which weighs the most being the scales. Upon first attempting to solve this riddle some children might think in terms of the various parts of the fish, as the head, the body, the tail, etc., but they would then come to the conclusion that none of these could be the correct answer inasmuch as such a solution would make the question a factual one and not one of the riddle type.

In attempting to solve the second riddle, "What is it that is a cat and not a cat, and yet is a cat?" the child might begin by thinking of the cat family: tiger, leopard, etc. He would readily see that the correct answer could not be along that line. He might then turn to thinking of a part of a cat, of half a cat, of a small cat, and, finally, of a kitten. In the last-mentioned idea he has the solution which is the logical one, for a kitten is a small cat, is in the growing process of becoming a cat, yet is now not a cat. Therefore, the

clue to this riddle lies not in the qualities relating to the cat family but in the qualities of the word "cat" itself.

The next riddle the testee encounters is the one which asks "What kin is that child to its father who is not its own father's son?" The primary impulse would point to some relationship. Because of the words, "is not its own father's son," some of the children tested might have been misled into thinking of relationships that would result through second marriages. Hence some answers might be such as "step-son" or "step-child." In rereading the riddle the child finds the words "what kin is that child to its father." This would point to a direct relationship, and hence "step-son" or "step-child" could not be correct. Going further along the same line of thought, the child, realizing that "father" is the keynote to the answer of this riddle and knowing from the wording of the riddle that the relationship is "not its own father's son," has only one alternative, another child of the opposite sex, which must be "daughter." Thus we find that the clue in this riddle is in determining the father relationships, which are either son or daughter. Since this riddle specifically states that the child is not a son, it must be a daughter.

In the psychological analysis of the next riddle, "Wipe my face and I'm everybody, scratch my back and I'm nobody. What am I?" there are several lines of thought which might be followed. One would be to think immediately of things with backs, such as match-box, chair, book, person, picture, etc., and then, in tying these up with the word

"scratch," chair, book, and picture would be eliminated, leaving match-box and person as possibilities, the backs of which could be scratched. Going further, to bring in the phrase, "Wipe my face," match-box would be eliminated, leaving person. With full reference to the riddle, we see that some change is involved in the process of face-wiping and back-scratching. Since a person does not change in these processes to become nobody or everybody, we eliminate the person. Following another line of thought, the hypothesis that "Wipe my face and I'm everybody" is the keynote, we would think of new things with which the term "face" is associated, also bearing in mind that wiping is involved, which would very naturally turn our thoughts to objects with glass faces, such as clock, picture, or mirror. Picture having been eliminated in the previous thought, and clock being eliminated because scratching its back does not effect a change, we find that a mirror fits because by wiping its front surface, or its face, it reflects all that appears before it, which might be everybody, and by scratching its back its reflecting power is destroyed and nothing can be seen - in other words, revealing nobody. Therefore all the requirements of the query are met, and this must be the correct answer.

Confronted with the riddle which asks, "What's the difference between a tight shoe and an oak tree?" the testee calls to mind all things pertaining to tight shoes - large feet, swollen feet, bunions, blisters, corns, etc., all or any of which would lead to sore or aching feet. Having gone along this line as far as he can, he now

turns to the other half of the riddle - the oak tree - and the qualities pertaining to it. He brings to mind such things as a big trunk, a large branch, many-fingered leaves, and acorns. Now, in attempting to discover a similarity in the qualities involved in tight shoes and oak trees, that he may then look for the dissimilarity, the testee repeats to himself the items of the first part - large feet, swollen feet, bunions, blisters, and corns - and the items of the second part - big trunk, large branch, many-fingered leaves, and acorns. He immediately notices a similarity in the sound of the words "corn" and "acorn," and out of the same phrase can produce "corns ache" as applying to the first part of the riddle, and "acorns" as applying to the second part of the riddle. In other words, it is a play upon words which expresses the difference.

In the sixth riddle, "If Dick's father is Tom's son, what relation is Tom to Dick?" relationship is again the primary thought. The riddle involves no intricate train of thought, but expresses a direct family kinship which can easily be reasoned. The testee places himself in the position of Dick, whose father is Tom's son. In reversing the latter phrase, Tom is the father of Dick's father. Dick's father's father is Tom, therefore Tom is Dick's grandfather. In the table showing the riddles arranged in order of difficulty, this riddle rates second-easiest.

The next riddle, "Why should a man never tell his secrets in a cornfield?" was solved correctly by the greatest number of students.

It is surprising to note that so many city-bred children were able to reason accurately a problem dealing with a matter pertaining to the farm. In analyzing this riddle, the testee looks upon "secrets" as the important word. "Telling secrets" involves things that should not be heard, and to be able to hear things the listener must have ears. Here the cornfield is immediately brought to mind, for the cornfield abounds with "ears" of corn. Hence, a man should not "tell his secrets in a cornfield" because a cornfield has ears.

Riddle No. 8 asks, "Why are married men like boilers?" Since it is too difficult to enumerate all the qualities which might apply to married men, the natural impulse is to seek the qualities of boilers, keeping in mind that one must be found which can be applied as well to married men. In making a mental list of boiler qualities we must eliminate such qualities as "hot water," "steam," or "iron," which obviously could not apply, and turn then to some unusual phase relating to boilers, such as "noisy ones," "hot ones," "defective ones," etc. Enlarging further upon these qualities, we find ourselves limited at once with respect to "noisy" and "hot" but with reference to defective boilers we think of boilers which go out of order, which cannot be used, which blow up. We find that the ones which pertain to married men, in a humorous sense, are the boilers that "blow up." This is, therefore, the correct solution to the riddle.

In attempting to solve the next riddle, "Why is a leaky barrel like a coward?" the child at once realizes that he must find a char-

acteristic feature of a leaky barrel that is similar to a characteristic feature of a coward. In making a mental list of the qualities of a leaky barrel, the testee would think of such descriptive features as wetness, dripping, running. He then turns to the other half of the riddle, and his mental image of a coward would suggest fear, and a drawing-away from the object of fear, resulting in running. There is an immediate correlation, for without further analysis the child discovers that "a leaky barrel is like a coward" because they both run. In this riddle we find that the two clues are joined with the word "like." Whenever the words "like" or "as" are used we must search for a simile. In the above instance the simile can be explained in the following manner: In speaking of a leaky barrel, we might say that it was "running like a coward." Or, on the other hand, we might say that a coward was "running like a leaky barrel." Whenever the riddle contains the comparative or "simile" idea, the testee has only to list the qualities of one point and look for a similar quality or relationship in the other point to find the correct answer.

The tenth riddle asks the question, "When can you carry water in a sieve?" The first realization we have after reading this problem is a mental description of a sieve. We readily see that a sieve is made up of many holes for the purpose of draining. We realize that it cannot hold a thin liquid, such a water, and therefore water could not be carried in a sieve, but since the riddle specifically asks "When can you carry water in a sieve?" we realize that there must be a trick to

it. Then the word "when" attracts our attention, and we seek to discover when water is in some form other than a liquid. Immediately we think of ice, which is water in a frozen form, and whereas water is a liquid, ice is a solid. Our problem is solved with this, for it fulfils the requirements of the riddle. Water can be carried in a sieve when it is ice.

The testee's next riddle is "What is the best material for kites?" The first reaction would be to think of paper, wood, and cloth, but realizing that any or all of these would be factual, he discards them. Without a doubt, this is a catch problem. He turns his attention to kites, and a mental picture shows him a kite, soaring in the air, floating against the sky, sailing like a bird, and when it dips and swoops it appears to be a bird, flying in the air. Bearing all this in mind, he again turns his attention to the word "material." A kite is like a bird. . . A bird flies and a kite flies. A kite made of paper is the commonest. The association of ideas is at once apparent, that the best material for kites is flypaper.

Turning our attention to the next problem, we are confronted with the question, "What kind of a hen lays the longest?" After reading this riddle, our first impulse would be to make a list of different kinds of hens. Since we are city-bred, we would hardly know various breeds of chickens, and anything of that nature would be too factual, so we think in terms of big hen, small hen, chicken, but we discard all of them on the grounds that there is nothing definite about the length of time that any of them might lay. Turning back to the riddle, we

reread it and come to the conclusion that the clue or key word is "kind." A hen that lies for any length of time would have to be a quiet one. A mental image of a hen is of a little, feathery animal that flutters about. On the other hand, a setting hen is quiet, so quiet that one might think it asleep. Association of ideas recalls the similarities between sleep and death. Death is quiet, too. A dead hen would be a quiet one, a dead hen would lie quiet for a long time. In fact, a dead hen would lie the longest. This riddle, of course, depends upon the misuse of a form of the verb <u>to lie</u>, but the fact that the riddle proved to be the fifth-easiest would appear to indicate that children are not needlessly critical of such points when dealing with riddles.

The next riddle for the child is "When is sugar like a pig's tooth?" In the table showing the riddles arranged in order of difficulty this problem ranks the lowest, being correctly answered just once out of 600 tests. Here, too, is the simile idea, but in this instance the riddle has the reservation of the word "when" in reference to the first part. In listing the ideas associated with the thought of sugar, the child would think of such things as sweet, candy, granulated sugar, lump sugar, sugar containers such as sugar bowls, bags, barrels of sugar, etc. In listing the ideas associated with the thought of a pig's tooth, the child finds himself rather limited. Naturally the pig's tooth is in the head of the pig. A hog is another name for a pig - so a pig's tooth could be a hog's tooth, and a hog's tooth would be in a hog's head. The word "hog's head" may also relate to a barrel,

a barrel that could contain sugar. Therefore, sugar is like a pig's tooth when it is in a hogshead. We may state here that this riddle was a difficult one to solve because the association of ideas involved is not a common one.

The question in the next riddle is "How many peas in a pint?" At a first glance the child's impression might be to determine the number of green peas that could be contained in a pint measure. However, to determine this, it would be necessary to have a given pint measure into which could be counted a number of green peas. This, of course, is too factual to be the solution. The next most likely impression would be to look for a catch or trick in the riddle. In rereading the puzzle the child might discover the alliteration of the words "peas" - "pint," and following this same line of thought, to his mind comes the association of "peas" and "P's" in the alphabet. There is a quick mental reaction, and he finds the letter "P" in the word "pint;" the resultant answer is that there is one P in a pint. In this riddle it is the sound of the words that furnishes the clue to the correct solution, and also the play upon the word "peas" that solves the problem.

Riddle No. 15 asks, "When does a leopard change his spots?" In our first analysis we have a mental picture of a wild and ferocious animal, yellow in color and irregularly spotted with dark markings. The problem asks "When does a leopard change his spots?" and we immediately presume that it means "When does a leopard change the spots on his skin?" We consider the following possible changes that might occur

to cause the spots on the fur of the leopard to be altered: becoming covered with paint; bruising and tearing the skin; etc. However, we readily see that such answers would be too factual and we discard them on that ground. In rereading the riddle, we pay special attention to the words "when" and "spots." We ask ourselves what other spots a leopard could have, other than those on his skin, and, after due deliberation, find that the word "spots" could also mean place, site, location. So, in other words, a leopard could change his spots when he moves from one location to another, or from one spot to another.

In the following riddle we find the problem asks, "Why is the Fourth of July like oysters?" As soon as we see the word "like" we know that this is another of the simile or comparative riddles. Our next step is to make mental lists of the two points in the problem, showing the characteristic features of the one that could be compared with the characteristic qualities of the other. On the one hand, the Fourth of July presents a mental picture of a warm summer day, parades, flags, cannon, fireworks, noises of popping fire-crackers, lights, and general hilarity. On the other hand, the word "oysters" gives us a mental image of seafood in general, of eating oysters, etc. In eating oysters the association of ideas brings to mind the gelatinous form of oysters, the shell of oysters, the general use of small wafers or crackers in connection with eating oysters. We attempt to find a correlation between our two lists and we find that the only thing that is at all alike is the fact that the Fourth of July brings to mind crackers

and the word "oysters" calls for the use of crackers in eating them. There is an immediate parallelism and we conclude that the Fourth of July is like oysters because neither can be enjoyed without crackers. In the above riddle, we note that there is a play on the word "crackers" defined in the sense of edible wafers and also in the sense of fire-crackers.

The next riddle the testee finds before him asks, "What is that which makes everything visible, yet is itself unseen?" The first half of the riddle calls for something that makes everything visible. The child, in making a mental list of such things, would naturally think first of the sun. However, since the balance of the problem states that the object "is itself unseen," he immediately discards the sun as a possible answer. The testee then begins to enumerate the various things that make other things visible and such a list would include "moon," electric-light bulb," etc. But none of these being unseen, they, too, would have to be rejected as solutions. Then, with that mental process which we call "association of ideas," it occurs to the child that we only use electric-light bulbs, etc., when the sun isn't shining; that we use them most regularly at night; that in the daytime things are visible that would not be visible in the night; that in the daytime things are visible because of the sun; that the sun gives us light; that the moon, electric-light bulbs, etc., give us light; that light makes things visible, yet cannot be seen. Therefore, "Light makes everything visible, yet is itself unseen."

Riddle No. 18 is a poem:

"I always murmur, yet I never weep;
I always lie in bed, yet never sleep;
My mouth is wide and larger than my head,
And much disgorges though 'tis never fed;
I have no legs nor feet, yet swiftly run,
And the more falls I get, move faster on.

What am I?"

This riddle allows for a great deal of comparison. We must pick out the various qualities mentioned in the problem, find objects of which they are most characteristic, and then find one object that fits all the descriptions and eliminates all other possible solutions. We take the first line, "I always murmur, yet I never weep." Our mental list of things that murmur includes voices of people, an ailing heart, and, in the words of poets, such things as the murmur of the wind, murmuring streams, and the murmur of trees. But since these murmuring things must never weep, we discard people. The next line states, "I always lie in bed, yet never sleep." This further eliminates the wind and the trees, but still includes an ailing heart and a murmuring stream. The next line states, "My mouth is wide and larger than my head," and we find we must discard "an ailing heart" because it has no mouth or head. In a quick survey of the balance of the riddle we find that our "stream" fits correctly, for a stream or river murmurs but doesn't weep; it always lies in bed - the river-bed - yet never sleeps; its mouth is wide and larger than its head, which is the source; and much disgorges though 'tis never fed - sediment carried along in the stream finally discharging itself along the banks or into another body of

water at the mouth; it has no legs nor feet, yet swiftly runs; and the more falls it gets, moves faster on - falls, meaning waterfalls, whereby the river's momentum is increased. The children found this a comparatively easy riddle to solve, doubtless due to the fact that there were so many possibilities, so many chances, so many clues in the problem, all pointing to the one correct answer - a river or stream.

The next riddle asks, "What table has no legs to stand upon?" Confronted with this problem, the child might try to picture a table without legs, and he would probably succeed in visualizing only a tabletop without the legs. This, he realizes at once, is a catch problem. He focuses his attention on the word "table" and to him comes the other definition of the word, the shortened form of the word "tabulation." In that sense of the word he can name several kinds of tables, such as time-table, table of contents, multiplication table, etc., etc. All or any of these could be the exactly correct answer, for though they are "tables," they "have no legs to stand upon." This riddle was based upon the dual definition of the word "table."

Riddle No. 20 is another poem:

"Running up and down, I make
My little fingers ache;
Though I'm found within the sea,
I can measure pounds of tea;
Often glittering, rainbow-specked,
I adorn and I protect.

What am I?"

As in Riddle No. 18, this problem offers a great deal of comparison. However, in this problem, the child might go about it in this fashion:

After reading over the problem, instead of analyzing each part, he might pick out those portions of which it would be the easiest to form mental pictures. Skimming over the poem, he comes to the phrase, "found within the sea." This immediately brings a vision of sand, salt, stones, sea-shells, waves, water, sea-weed, fish, boats, swimmers, etc. The next familiar phrase would be "measure pounds of tea." Weight measures are made only on scales; whereas bulk could be measured in pint, quart, or gallon containers; but since the poem states "measure pounds of tea," the testee concludes that it must be scales. He then tries to apply the word "scales" to the rest of the poem and finds that it fits in every instance, for musical scales do make one's fingers ache when they are played continuously on the piano - "running up and down, I make my little fingers ache;" scales are found within the sea - fish scales, "though I'm found within the sea;" scales are used in measuring - "I can measure pounds of tea;" fish-scales may be varied in color and are not only often beautiful and multi-colored but in all cases are a protection to the fish - "often glittering, rainbow-specked, I adorn and I protect." The comparison riddles are relatively simple to solve, for, as in Riddle No. 18 and also in this problem, the child is given many clues, many openings, all pointing to just one answer that could possibly be correct.

The testee is now confronted with another versified riddle, which asks:

"Pray tell me, children, if you can,
Who is that highly favored man,
Who, though he has married many a wife,
May still live single all his life?"

In this problem it is necessary to depict a man, who, though he has married many times, is still single. In solving this riddle, the natural thinking process would present a man who is a bachelor, a man who is a widower, or a man who had been divorced. The first of this group would be rejected because a bachelor is a man who has never married; and both a widower and a man who had been divorced would be eliminated because neither has lived singly all his life. We turn our attention back to the riddle and determine that the third line, "Who, though he has married many a wife," is the clue to the solution. Concentrating our attention on this clue, we realize that the verb "has married" furnishes an ambiguous meaning to the thought, for it could have reference not only to the bridegroom but also to the one performing the marriage ceremony. Had the verb been "was married to," it would definitely refer to the bridegroom. Since the bridegroom would scarcely be said to "live single," it unquestionably refers to the one performing the ceremony, the minister or clergyman. In reviewing the riddle with this solution in mind we find that it fits all the requirements.

The next problem offers the query, "What is it that the more you take from, the larger it grows?" The testee must find something that grows larger as some part of it is removed. Almost anything he thinks of grows larger as things are added to it, and smaller as any part of it is withdrawn. He may then seek for the solution in general terms

relating to the world about him, such as air, space, and the earth, the last bringing to mind a dirt-pile. As the dirt-pile is built up by the earth around it, a space gradually forms at its base. This space becomes larger as the dirt-pile is built up and the hole grows in size as the earth is transposed from it to the pile. In following out this train of thought the answer is revealed, and the testee sees that it is a hole that fits the qualifications of the riddle, for the more you take from it, the larger a hole grows.

Riddle No. 23 inquires, "What is that which, though black itself, enlightens the world?" In making a mental list of things that enlighten the world we have such ideas as: literature, art, education, music, and, in the modern sense, radio, newspapers, books, and magazines. We then list those of the above which are black. We discard education, because education in itself is too general; art, because it may consist of various color combinations; music and radio because both depend upon hearing and appeal to the auditory sense rather than to the optical sense. This leaves us with literature, newspapers, books, and magazines. Why do we regard these as black? Merely because of the printed word, and therein lies our solution. "Ink, though black itself, enlightens the world."

The testee's next riddle asks, "Why ought women to be employed in a postoffice?" In a general analysis of this problem, we find that by listing the qualities of women, in general, and also the characteristic features of a postoffice, we must find some similar or related quality

in both. Of course, a mental picture of a postoffice involves quantities of letters, great amounts of mail. The word "mail" in its other spelling, "male," gives us an association of ideas in connection with the other half of this riddle, relating to "women." We at once see that the correct answer to the query is that "women ought to be employed in a postoffice" because they know how to manage the "males." In summarizing this riddle, we conclude that the clue or trick is the play upon the spelling of the word "mail." This problem may be classified as one of the "pun" riddles of this group.

The child's next riddle is, "When is a wall like a fish?" This problem is one of the comparative group. We must search for a simile as soon as we see the word "like." A mental image of the characteristic features of a fish advances such descriptive points as body, head, tail, scales, fins, etc. A description of a wall defines it as an enclosure to prevent trespassing. A high wall would be one that could not be climbed or crossed without the aid or assistance of someone or something, such as a ladder, rope, etc. In speaking of climbing a wall, we often use the term "scale a wall." There is an immediate correlation of ideas, and we find that though a wall can be scaled, a fish can also be scaled. However, the two definitions of the word "scaled" in the above instances are different, for to "scale a wall" is to climb it, and to "scale a fish" is to clean it of its scales. We are not dealing, however, with factual qualities, and the answer to this riddle is, "A wall is like a fish when it can be scaled." This problem also uses the

pun or play upon words.

The next riddle to confront us asks, "What is it which more people lie under than upon?" In listing the qualities of the phrase "lie under," we naturally think of such things as blankets, quilts, sheets, and other coverings. On the other hand, listing the qualities of things we lie upon, we would cite such things as beds, cots, grassy fields, sand, etc. In considering the question asked in this riddle we would discard in the latter group beds and cots, retaining as possibilities grassy fields and sand. In rereading the riddle we note the stipulation that the answer must be something "which more people lie under than upon. Since in a general phrase such as one involving "more people" we would think in terms of the world as a whole, past as well as present generations, we realize that the number of people who have lived on this earth in the past far exceeds the number now in existence. Whereupon we note at once that more people have died and are buried than are at present living. To conclude, "the earth" is that "which more people lie under than upon." It may be stated that this riddle was one of the most difficult for the pupils to solve, which may be due to the fact that the process of reasoning involved in its solution was possibly too advanced for youngsters of adolescent age.

The riddle now before us makes the following query: "What is it that has four legs and only one foot?" The natural line of attack would be to list all objects with four legs, which would include all animals and such pieces of furniture as chairs, couches, bedsteads,

tables, etc. Calling into play the fact that the desired object must have, as well, only one foot, we at once discard the entire animal kingdom, for obvious reasons, and such pieces of furniture as chairs and couches. Speaking of tables, while one can be said to have a head and a foot, these relative terms could only be applied in connection with seating arrangements and hence could be discarded as a remote solution. On the other hand, speaking of a bedstead, this definitely has a head and foot as well as four legs, and thus meets exactly the requirements of this riddle.

The next riddle states: "You can hang me on the wall, but if you take me down, you cannot hang me up again. What am I?" To consider the possibilities that may be hung upon a wall, there are pictures, mirrors, panels, draperies, lights, and wallpaper itself. However, all of these can be removed and then replaced with the exception of wallpaper, which is damaged or destroyed in the process of removal. Wallpaper is therefore the correct solution to this problem. The association of ideas in this riddle is very simple, and, as may be seen in the table showing the riddles arranged in order of difficulty, this riddle rated third highest in solution.

In the following riddle, "Which travels faster, heat or cold?" the testee, since he has no means of computing the rate of speed at which heat or cold may travel in any direction, and since such an answer would be too factual, assumes at once that this is a catch problem and looks for the word which may have an ambiguous meaning. Such a word is

"cold," which may be regarded as a condition of temperature or as a common physical ailment. And with the latter definition in mind, the testee readily associates with the noun "cold" the verb "catch." A cold is a common physical ailment; in other words, one can quickly "catch cold." Thus, in answering this riddle, he concludes that "heat travels faster" because one can quickly catch cold.

The final riddle asks, "Why are lollypops like race horses?" This is another of the simile group of riddles and we must list the qualities of lollypops in comparison with those of race horses. The immediate characteristics brought to mind in association with lollypops are flavors, shape, size, and their great popularity as a child's confection. With the last idea in mind, we at once visualize a child's sticky hands and face as he is greedily engaged in licking his lollypop. The usual idea associated with race horses involves spirited animals pounding over a race-course, with jockeys perched high atop the animals, whipping, or, to use a slang expression, "licking" them in an effort to increase their speed. There is a definite correlation here between the idea of the child licking his lollypop until it is gone and the idea of the jockeys licking the race horses to urge them to go faster. The solution at once comes to mind, that "lollypops are like race horses" because the faster one licks them, the faster they go.

Riddles of the comparative group such as those containing the words "like" or "as" are more or less in the nature of similes. In solving this type of problem the testee makes mental lists of the two

qualities to be compared and attempts to find qualities or relationships in both that are similar. The greatest percentage of riddles have some trick word or clue phrase that offers an association of ideas or affords a mental image wherein the correct solution can be found. Very often the trick word is one having a double definition and is in the nature of a pun. The play-upon-words idea is a common one used in the formulation of riddles. In seeking the solution of a riddle it is always a good idea to look for some unusual phrase in the wording, a double-definition word or a trick clue. A problem to be a riddle must contain a unique idea, for if it were matter-of-fact and straightforward it would not be classified as a riddle.

In trying to distinguish the difference between easy riddles and difficult riddles in our experiment, one must believe that the easier type of riddle was able to be solved because the particular situation fitted into the boy's or girl's past experience or knowledge more readily than the riddle which was too novel for the individual's capacity.

It can be seen from the experiment that the third- and fourth-year-high-school group solved correctly more riddles than the seventh- or eighth-grade group. This is due to the better connection-forming or association of ideas, to the greater extent of information, and to the more specialized habits of thinking which have developed in fourth-year-high-school groups as compared with seventh- and eighth-grade groups.

One must believe that since the third- and fourth-year-high-school

pupils are older chronologically and their level of intelligence is on a higher plane than that of seventh- and eighth-grade pupils, the more advanced group should excel in solving riddles because of the increased power in inference or reasoning of its individuals, their keener perception and use of relations, and their greater ability to manage novel or original tasks.

Psychologically, degrees of intelligence in the solving of riddles seem to depend on the facility with which the subject-matter of experience can be organized into new patterns. This rearrangement of thought material is what characterizes particularly the higher mental processes. It fits admirably the behavioristic description of intelligence as the capacity for adaptation to novel situations.

TYPES OF RIDDLES

After reviewing and analyzing the thirty riddles, the following types are revealed:

(1) Riddles requiring an element in the object or action to fit the clue word.

To this group belong Riddles No. 1, 7, 11, and 27.

(2) Riddles which involve the finding of common qualities or relationships.

To this group belong Riddles No. 3, 4, 6, 8, 9, 10, 12, 17, 18, 20, 22, 23, 26, 28, and 30.

(3) Riddles which involve clue words with double meanings.

(a) Puns

To this group belong Riddles No. 5, 14, 21, 24, and 25.

(b) Definitions

To this group belong Riddles No. 2, 13, 15, 16, 19, and 29.

TABLE XIV

RIDDLES ARRANGED IN ORDER OF DIFFICULTY

N = 600

(Beginning with easiest, which is Riddle 7)

Rank	Riddle No.	Percentage of Correct Answers
1	7	76.0
2	6	67.1
3	28	58.1
4	8	52.3
5	12	51.0
6	9	50.0
7	2	49.1
8	19	49.1
9	29	44.3
10	18	44.0
11	30	38.3
12	14	34.3
13	1	31.1
14	21	28.6
15	22	27.5
16	25	26.3
17	17	25.3
18	15	25.1
19	5	24.6
20	4	22.3
21	10	20.1
22	3	18.6
23	20	15.5
24	11	14.8
25	24	13.0
26	27	13.0
27	26	5.5
28	16	4.8
29	23	4.8
30	13	.001

CHAPTER VI

SUMMARY AND CONCLUSION

Before endeavoring to reduce the results of this series of experiments to definite conclusions, we must acknowledge that there are not a great many unqualified statements which can stand as being fully justified by the data gathered.

The correlation between riddle scores and mental age is .545±.007, which indicates a rather low relationship. But, while the correlation for the entire group was low, the correlation between riddle scores and mental age was higher in the seventh and eighth grades, reaching .640±.038 in the seventh grade and decreasing steadily to −.057±.066 in the twelfth grade. This is due probably to the fact that riddles lend themselves more easily to pupils of seventh- and eighth-grade ages and that their minds are more elastic than those of the upper-class students, and further, that riddle tests fall more along the line of the younger students' interests.

Though this experiment when first begun did not propose to consider the possibilities of correlating riddle scores with mathematics grades, nevertheless a request for the last semester's mathematics grade for each pupil was asked for along with the other data. In comparing the mathematics grades with riddle scores there was very little relationship in each grade, as can be seen from Table XI. The total correlation

for the entire group was .100±.026, which indicates that it is not necessary to have high marks in mathematics in order to be able to solve riddles.

In segregating the boys' mental ages from the girls' in order to correlate each with riddle score, one finds from the data that the correlation is the highest in seventh grade and decreases for each year in each sex, probably due to the flexibility of mind in the younger students, which makes them adapt themselves to riddles more easily.

From the data gathered one can see that the girls' mental age correlated with the riddle score to the extent of .629±.036 as compared with the correlation of the boys' mental age with riddle score of .458±.003, which indicates the girls' superiority in handling the riddles as a whole. This may be due to the selection of the riddles themselves, for it appears that the girls solved the family-relationship type of riddle and riddles in the form of short poems more readily than the boys. It is difficult to distinguish positively what is due to sex from what is caused by interest and training.

The correlations of I. Q. and C. A. with riddle score are exceedingly low, being .206±.025 and .408±.022, respectively, indicating very slight relationship between the I. Q. and ability to solve riddles and the C. A. and ability to solve riddles.

The low correlation in general for the total experiment may be ascribed either to the fact that the ability to solve riddles has very slight relationship to mental age or that the solution of riddles de-

mands somewhat different abilities than those contemplated on in this experiment.

This study has been undertaken in the belief that riddles provide a relatively unknown but very promising means of studying certain phases of the human intelligence, but as the data and results herein found do not warrant very positive statements, it is hoped that this type of investigation will be further pursued, to the end that scientific and fundamentally valuable results may ensue.

APPENDIX

NAME_____ I. Q._____ AGE_____ MENTAL AGE_____

SCHOOL_____ DATE_____ GRADE_____

BOY OR GIRL_____ LAST SEMESTER'S MATH. GRADE_____

RIDDLE QUIZ

Here is a set of thirty riddles. Try your skill and see how many you can answer correctly. You will be allowed forty-five minutes. Do not spend too much time trying to answer a riddle which is difficult for you. Go on to the end; then return to the riddles you have failed to solve, if you have time to spare, and try again.

1. What part of a fish weighs the most? scales
2. What is it that is a cat and not a cat, and yet is a cat? kitten
3. What kin is that child to its father who is not its own father's son? daughter
4. Wipe my face and I'm everybody, scratch my back and I'm nobody. What am I? a mirror
5. What's the difference between a tight shoe and an oak tree? the one makes corns ache; the other makes acorns
6. If Dick's father is Tom's son, what relation is Tom to Dick? Tom is Dick's grandfather
7. Why should a man never tell his secrets in a cornfield? there are too many ears
8. Why are married men like boilers? they blow up sometimes
9. Why is a leaky barrel like a coward? they both run
10. When can you carry water in a sieve? when it's ice
11. What is the best material for kites? flypaper
12. What kind of a hen lays the longest? a dead hen

RIDDLE QUIZ

NAME _____ SCHOOL _____

13. When is sugar like a pig's tooth? when it's in a hogshead

14. How many peas in a pint? one

15. When does a leopard change his spots? when he moves from one spot to another

16. Why is the Fourth of July like oysters? can't be enjoyed without crackers

17. What is that which makes everything visible, yet is itself unseen? light

18. I always murmur, yet I never weep;
I always lie in bed, yet never sleep;
My mouth is wide and larger than my head,
And much disgorges though 'tis never fed;
I have no legs nor feet, yet swiftly run,
And the more falls I get, move faster on.

What am I? a river

19. What table has no legs to stand upon? multiplication table

20. Running up and down, I make
My little fingers ache;
Though I'm found within the sea,
I can measure pounds of tea;
Often glittering, rainbow-specked,
I adorn and I protect. What am I? scales

21. Pray tell me, children, if you can
Who is that highly favored man,
Who, though he has married many a wife,
May still live single all his life? priest, minister, or clergyman

22. What is it that the more you take from, the larger it grows? a hole

23. What is that which, though black itself, enlightens the world? ink

RIDDLE QUIZ

NAME_____ SCHOOL_____

24. Why ought women to be employed in a postoffice? they know how to manage the "males"

25. When is a wall like a fish? when it can be scaled

26. What is it which more people lie under than upon? the ground

27. What is it that has four legs and only one foot? a bedstead

28. You can hang me on the wall, but if you take me down, you cannot hang me up again. What am I? wallpaper

29. Which travels faster, heat or cold? heat, because you can quickly catch cold

30. Why are lollypops like race horses? faster you lick them, the faster they go

TABLE XV

SEX, C. A., M. A., I. Q., MATHEMATICS GRADE, AND NUMBER OF RIDDLES SOLVED CORRECTLY FOR 100 SEVENTH-GRADE PUPILS

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
1	G	12-6	13-9	110	80	11
2	B	12-6	11-10	95	80	7
3	B	13-8	15-0	110	80	13
4	G	14-5	11-6	80	95	4
5	G	15-3	16-9	110	80	11
6	G	12-4	13-6	110	80	11
7	G	14-1	12-8	90	80	5
8	G	12-7	11-3	90	95	5
9	G	12-7	11-10	95	60	8
10	G	13-3	12-6	95	90	6
11	G	12-0	11-5	95	80	7
12	B	13-5	14-9	110	90	13
13	B	15-3	13-8	90	75	4
14	G	12-6	11-10	95	80	8
15	B	13-10	13-1	95	65	4
16	B	14-0	15-5	110	95	11
17	G	12-0	11-5	95	80	8
18	G	12-0	13-3	110	90	9
19	G	12-7	13-9	110	90	7
20	G	12-7	11-3	90	75	5
21	G	11-11	11-4	95	80	7
22	G	11-4	12-5	110	80	3
23	G	12-1	11-4	95	90	5
24	G	13-1	11-9	90	95	9
25	G	13-5	10-9	80	80	4
26	B	13-1	12-5	95	80	6
27	G	11-2	12-3	110	90	5
28	G	12-8	10-3	80	70	4
29	G	11-11	11-4	95	80	6
30	G	12-9	10-9	85	90	6
31	G	12-1	11-6	95	95	5
32	G	12-8	13-10	110	85	12
33	G	12-8	13-10	110	80	11
34	G	13-9	15-2	110	80	8
35	G	12-6	11-11	95	80	6

TABLE XV (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
36	G	12-11	14-3	110	80	9
37	G	13-3	14-7	110	95	8
38	B	13-5	14-9	110	80	7
39	B	12-5	13-8	110	90	7
40	B	12-10	14-1	110	90	4
41	B	12-5	13-8	110	60	7
42	G	13-6	10-10	80	90	3
43	G	13-6	10-10	80	90	0
44	B	12-1	13-2	110	80	7
45	B	12-10	14-1	110	80	4
46	B	12-7	11-4	90	80	5
47	B	12-10	12-2	95	80	8
48	B	11-11	13-1	110	80	7
49	G	12-11	11-7	90	80	1
50	G	12-10	12-2	95	80	5
51	B	12-8	13-11	110	80	11
52	G	12-3	11-0	90	90	2
53	B	12-8	13-0	95	80	6
54	G	12-10	12-2	95	80	5
55	G	12-5	9-11	80	80	4
56	G	12-10	14-1	110	85	7
57	G	12-0	11-5	95	90	4
58	B	12-9	12-1	95	80	4
59	G	12-10	10-11	85	80	4
60	G	11-11	10-9	90	80	4
61	B	12-0	11-9	98	80	7
62	B	12-11	12-8	98	75	7
63	B	13-7	12-11	95	95	8
64	G	13-2	14-6	110	95	8
65	G	13-4	10-8	80	90	3
66	G	12-3	13-6	110	95	9
67	B	14-0	13-9	98	60	7
68	G	14-2	15-7	110	95	8
69	G	13-11	11-10	85	95	5
70	G	12-9	12-0	85	95	4

TABLE XV (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
71	B	15-2	12-2	80	80	9
72	B	12-11	11-0	85	95	2
73	G	13-4	10-8	80	80	2
74	B	11-10	10-8	90	80	5
75	G	14-1	13-5	95	95	13
76	G	13-11	12-6	90	95	6
77	G	12-0	11-0	92	95	6
78	G	13-6	11-11	88	95	6
79	B	13-10	13-2	95	95	4
80	G	13-7	12-0	88	80	5
81	B	14-4	16-4	115	65	12
82	G	12-6	11-3	90	95	3
83	G	13-0	14-4	110	95	8
84	B	13-2	11-2	85	95	5
85	G	12-7	11-4	90	70	4
86	G	12-8	12-0	95	95	6
87	B	12-7	10-8	85	95	6
88	B	13-3	10-7	80	95	6
89	G	12-8	12-0	95	95	8
90	G	12-4	13-7	110	95	9
91	B	14-1	11-3	80	80	1
92	B	16-9	13-5	80	60	8
93	G	12-10	9-0	70	95	7
94	G	13-0	14-4	110	85	9
95	B	14-1	11-3	80	80	3
96	G	15-0	13-6	90	95	6
97	G	12-4	13-7	110	90	10
98	G	12-3	13-6	110	75	10
99	B	13-4	14-8	110	80	11
100	G	11-11	13-1	110	80	11

TABLE XVI

SEX, C. A., M. A., I. Q., MATHEMATICS GRADE, AND NUMBER OF RIDDLES SOLVED CORRECTLY FOR 100 EIGHTH-GRADE PUPILS

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
1	B	14-2	13-5	95	95	7
2	B	17-0	13-7	80	60	9
3	B	14-2	13-11	98	95	7
4	B	13-2	14-5	110	95	9
5	B	13-0	12-4	95	65	8
6	B	13-0	11-9	90	70	10
7	B	13-2	11-9	90	60	5
8	B	12-11	14-2	110	95	8
9	B	13-0	10-5	80	95	1
10	B	14-0	12-7	90	90	9
11	B	15-0	12-0	80	95	4
12	B	13-2	14-5	110	90	8
13	B	14-10	11-10	80	65	2
14	B	12-8	13-10	110	70	8
15	B	15-0	13-6	90	60	8
16	B	14-2	11-3	80	65	5
17	G	14-6	12-7	85	70	4
18	G	12-10	14-1	110	70	9
19	G	13-4	10-8	80	80	2
20	G	14-7	13-7	95	70	7
21	G	13-2	11-9	90	60	4
22	G	12-9	11-5	90	90	6
23	G	13-6	12-10	95	70	8
24	G	13-1	11-6	88	60	2
25	G	13-2	12-5	95	65	7
26	G	14-2	12-8	90	65	4
27	B	14-1	15-6	110	90	8
28	G	12-0	10-3	85	90	2
29	G	13-0	11-9	90	65	7
30	G	13-0	11-9	90	70	5
31	G	13-6	12-2	90	90	4
32	B	13-4	12-0	90	80	4
33	G	13-9	12-4	90	60	4
34	G	13-3	14-6	110	95	10
35	G	14-11	11-11	80	65	5

TABLE XVI (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
36	G	14-0	11-3	80	60	2
37	G	13-6	12-10	95	90	8
38	G	13-0	11-9	90	90	3
39	G	13-9	13-0	95	90	3
40	B	14-7	13-0	90	80	6
41	B	15-0	16-6	110	70	11
42	B	15-0	13-6	90	90	5
43	B	14-10	11-10	80	90	1
44	B	16-0	14-5	90	95	5
45	B	15-0	12-9	85	80	4
46	B	14-0	11-11	85	60	4
47	B	13-0	14-4	110	95	7
48	B	16-0	13-7	85	95	4
49	G	15-2	16-7	110	90	11
50	G	13-11	13-2	95	85	6
51	G	13-2	11-9	90	95	6
52	G	13-6	12-10	85	95	4
53	G	14-11	13-5	90	90	6
54	G	14-0	11-2	85	60	0
55	G	14-7	11-7	80	65	2
56	G	13-0	12-4	95	65	6
57	B	15-0	13-6	90	95	6
58	G	15-0	12-0	80	60	3
59	G	14-0	11-11	85	95	5
60	G	15-0	17-3	115	95	11
61	B	14-11	12-8	85	60	3
62	B	13-0	11-9	90	95	4
63	G	14-2	11-3	80	90	6
64	B	15-3	18-3	120	95	12
65	G	12-3	13-5	110	80	5
66	G	12-4	13-6	110	85	9
67	G	13-7	12-10	95	85	5
68	G	12-1	14-6	120	90	10
69	G	12-3	11-7	95	80	4
70	G	13-0	12-4	95	90	8

TABLE XVI (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
71	G	12-4	10-1	90	80	6
72	G	12-8	13-10	110	95	11
73	G	13-0	11-9	90	65	8
74	G	12-5	13-8	110	95	10
75	G	13-1	10-5	80	60	0
76	G	12-8	11-11	95	85	8
77	B	16-0	12-10	80	60	2
78	G	14-10	11-10	80	95	2
79	G	12-9	12-1	95	75	8
80	B	13-1	14-5	110	95	9
81	B	12-11	11-8	90	75	5
82	B	13-7	14-10	110	95	8
83	B	15-1	12-1	80	85	2
84	B	13-8	14-11	110	85	10
85	B	13-5	14-10	110	95	4
86	B	13-4	15-2	115	95	10
87	B	11-11	10-9	90	80	4
88	B	16-0	14-5	90	75	13
89	B	14-0	11-3	80	90	2
90	B	15-6	13-2	85	85	4
91	B	12-10	12-2	95	80	7
92	B	13-0	11-8	90	60	4
93	B	12-0	13-3	110	95	9
94	B	12-5	11-9	95	80	8
95	B	12-11	12-3	95	70	8
96	B	13-7	14-10	110	95	10
97	B	12-11	11-8	90	80	6
98	B	12-1	13-10	115	85	11
99	B	15-5	13-10	90	80	6
100	G	15-0	12-0	80	60	4

TABLE XVII

SEX, C. A., M. A., I. Q., MATHEMATICS GRADE, AND NUMBER OF RIDDLES SOLVED CORRECTLY FOR 100 NINTH-GRADE PUPILS

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
1	G	17-6	19-3	110	80	14
2	G	14-6	15-7	108	95	12
3	B	15-3	16-3	108	80	11
4	G	15-3	14-6	95	85	5
5	B	16-2	16-4	102	90	4
6	G	16-6	15-9	96	95	4
7	G	14-6	13-9	96	85	4
8	B	14-0	14-4	103	80	11
9	G	14-6	13-9	95	90	13
10	B	16-8	13-4	80	75	6
11	B	15-10	15-6	86	85	5
12	B	15-11	15-6	97	85	2
13	G	14-10	14-1	95	95	15
14	G	14-0	14-0	100	85	5
15	G	14-0	13-3	95	75	5
16	G	13-2	12-6	95	90	4
17	G	15-8	14-1	90	85	4
18	G	12-11	13-0	100	90	11
19	G	12-4	13-0	105	90	8
20	G	13-11	13-4	95	90	12
21	G	15-4	15-3	100	90	8
22	G	13-9	13-9	100	90	9
23	G	16-0	13-9	98	85	4
24	B	15-9	13-0	82	60	2
25	B	13-0	12-3	95	80	4
26	G	14-2	13-4	95	90	3
27	G	14-0	14-9	106	90	8
28	G	14-3	14-3	100	85	5
29	G	14-10	13-9	93	95	7
30	B	14-0	13-3	95	85	8
31	B	16-0	14-4	90	80	4
32	B	14-3	15-0	106	80	10
33	G	14-9	13-3	90	80	1
34	G	14-5	13-9	95	80	4
35	G	13-8	13-8	100	80	4

TABLE XVII (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
36	G	14-2	14-2	100	95	4
37	G	12-6	13-1	105	90	7
38	G	14-4	13-6	95	90	4
39	G	13-8	13-0	95	90	10
40	B	14-0	13-4	95	80	5
41	G	15-4	15-4	100	90	8
42	G	14-0	14-9	105	90	7
43	G	14-0	14-3	102	60	11
44	G	14-6	14-9	102	90	5
45	G	13-3	13-3	100	90	5
46	G	15-4	16-10	110	90	5
47	B	14-5	16-9	115	90	10
48	G	14-0	12-6	99	80	7
49	B	15-2	15-9	104	75	9
50	B	14-3	14-6	102	90	9
51	B	14-1	15-6	110	80	8
52	B	14-2	13-5	95	75	3
53	B	14-0	13-7	97	80	6
54	G	14-0	14-0	100	75	13
55	G	13-11	13-3	95	90	6
56	G	14-0	13-4	95	80	12
57	G	13-0	13-3	102	95	7
58	B	14-6	15-11	110	80	8
59	B	17-0	14-5	85	75	9
60	G	13-0	13-9	106	80	6
61	G	14-0	13-4	95	80	3
62	G	14-6	13-3	98	80	7
63	G	13-1	13-9	105	80	7
64	G	14-6	13-2	90	80	8
65	B	13-2	13-2	100	80	8
66	G	15-0	15-7	104	90	7
67	G	15-6	15-5	98	85	7
68	G	15-0	13-6	90	90	5
69	G	15-2	15-5	102	85	8
70	G	14-4	15-9	110	90	15

TABLE XVII (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
71	G	14-3	13-2	92	95	7
72	G	15-0	13-2	88	85	9
73	G	14-0	14-10	106	80	8
74	G	15-0	15-9	105	90	9
75	G	15-0	14-6	97	80	10
76	G	14-0	14-7	104	80	10
77	G	16-0	14-5	90	90	3
78	G	13-11	13-2	95	80	8
79	G	14-0	14-8	105	95	9
80	G	14-0	16-1	115	85	6
81	G	17-6	14-10	85	90	4
82	G	14-4	13-9	96	80	3
83	G	13-10	13-7	85	80	3
84	G	14-7	13-2	90	80	5
85	G	15-7	16-4	105	90	14
86	G	15-8	14-10	95	85	4
87	B	14-1	14-8	104	95	5
88	B	15-8	15-2	97	90	5
89	B	16-0	15-4	96	90	6
90	B	14-0	13-9	98	90	4
91	B	16-11	15-11	94	80	6
92	B	15-0	12-11	86	75	7
93	B	14-3	13-1	92	80	3
94	B	14-0	14-5	103	80	3
95	B	16-0	15-1	94	80	3
96	B	16-9	15-5	92	60	4
97	B	15-0	14-5	96	90	2
98	B	16-4	14-1	98	80	2
99	B	15-8	15-4	98	75	8
100	B	14-0	13-4	95	90	7

TABLE XVIII

SEX, C. A., M. A., I. Q., MATHEMATICS GRADE, AND NUMBER OF RIDDLES SOLVED CORRECTLY FOR 100 TENTH-GRADE PUPILS

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
1	G	15-6	17-1	110	80	13
2	G	15-0	17-3	115	90	10
3	G	16-0	18-3	115	90	9
4	B	16-0	14-5	90	75	11
5	B	16-4	15-6	95	80	5
6	B	14-6	14-4	99	80	3
7	G	17-8	15-6	88	75	4
8	B	17-0	17-0	100	80	11
9	G	14-11	14-2	95	80	15
10	B	15-11	14-4	90	70	15
11	G	15-3	16-9	110	80	11
12	B	17-3	16-4	95	80	10
13	B	15-5	13-1	85	65	10
14	G	15-2	14-4	95	80	9
15	G	15-0	14-3	95	80	6
16	B	15-6	14-9	95	75	4
17	G	15-2	14-4	95	80	9
18	G	15-2	16-8	110	90	11
19	B	15-11	14-4	90	75	9
20	B	15-2	14-4	95	80	8
21	B	16-2	18-6	115	95	15
22	B	15-5	14-8	95	75	15
23	G	15-6	13-11	90	80	1
24	B	15-0	14-3	95	75	4
25	B	16-0	15-3	95	75	10
26	B	15-0	14-3	95	80	16
27	B	15-0	12-9	85	60	10
28	B	16-3	15-4	95	80	10
29	B	14-3	13-3	95	75	14
30	B	15-8	17-2	110	80	14
31	B	15-7	14-8	95	90	15
32	B	17-2	19-9	115	80	8
33	G	15-3	16-9	110	80	14
34	G	14-9	18-10	110	90	14
35	G	15-0	14-3	95	80	9

TABLE XVIII (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
36	G	15-2	18-2	120	90	11
37	G	15-2	14-11	99	90	9
38	B	15-8	17-2	110	80	12
39	G	16-0	14-9	92	85	4
40	B	16-4	17-3	106	80	10
41	G	15-0	14-2	94	95	6
42	B	16-7	15-9	96	80	3
43	B	14-8	14-4	98	75	6
44	B	15-8	14-4	96	75	4
45	B	16-0	15-10	98	95	5
46	B	15-0	14-3	95	90	6
47	G	15-0	14-0	93	80	5
48	B	14-7	15-8	108	80	7
49	B	15-5	16-1	104	75	13
50	B	15-3	13-8	90	90	6
51	B	15-3	16-2	106	80	5
52	G	15-5	15-6	101	75	16
53	B	14-5	14-5	100	85	13
54	G	14-11	14-4	96	95	18
55	B	15-2	15-5	102	80	14
56	G	15-6	20-0	130	80	16
57	G	15-3	15-10	104	80	8
58	B	15-2	14-2	94	90	11
59	B	15-0	16-6	110	85	17
60	G	15-0	15-9	105	75	10
61	B	15-0	14-3	95	75	14
62	B	15-2	18-2	120	85	15
63	G	15-2	15-2	100	80	17
64	B	15-0	10-10	94	80	6
65	B	14-0	13-2	94	80	7
66	B	15-0	15-8	104	75	8
67	G	15-0	15-11	106	80	7
68	B	15-0	14-7	97	80	16
69	B	15-0	12-9	85	60	2
70	B	16-0	14-5	90	75	8

TABLE XVIII (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
71	B	16-0	15-3	95	80	8
72	B	16-2	15-9	98	75	9
73	B	16-1	15-9	98	80	6
74	B	15-0	15-9	105	80	4
75	B	16-2	12-10	80	90	8
76	B	15-6	17-1	110	85	7
77	B	15-2	18-2	120	95	11
78	B	15-7	15-7	100	75	11
79	B	14-6	14-6	100	85	15
80	B	14-3	12-9	90	85	13
81	B	16-0	15-3	95	80	13
82	B	15-5	14-8	95	75	12
83	B	16-0	14-5	90	75	4
84	G	14-3	15-4	108	75	7
85	G	16-0	16-8	104	75	4
86	B	17-7	16-8	95	80	3
87	B	17-0	16-5	95	85	6
88	B	15-0	13-3	88	80	5
89	B	15-0	13-2	86	80	6
90	B	16-0	14-9	92	75	9
91	B	15-0	12-7	84	80	9
92	B	14-0	13-9	98	85	6
93	B	16-0	16-2	95	85	10
94	B	15-2	15-0	99	80	8
95	B	14-0	14-4	102	85	12
96	B	15-3	16-0	105	85	7
97	B	16-0	13-2	82	80	6
98	B	15-8	13-1	85	60	5
99	B	15-4	14-1	92	65	2
100	B	15-1	15-0	98	80	4

TABLE XIX

SEX, C. A., M. A., I. Q., MATHEMATICS GRADE, AND NUMBER OF RIDDLES SOLVED CORRECTLY FOR 100 ELEVENTH-GRADE PUPILS

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
1	G	16-2	17-6	115	85	7
2	B	16-7	15-8	95	90	12
3	G	16-2	15-4	95	75	1
4	B	16-0	14-5	90	75	6
5	B	17-2	15-4	90	60	0
6	G	15-5	19-2	125	90	5
7	G	16-6	16-2	98	95	13
8	G	17-2	17-9	104	85	8
9	G	15-0	15-0	100	90	5
10	B	16-2	14-9	92	60	6
11	G	16-4	15-0	112	90	18
12	G	15-7	15-10	102	80	17
13	B	17-4	16-4	95	85	13
14	G	15-8	17-2	110	90	15
15	G	15-11	17-2	108	85	20
16	G	15-4	16-1	105	90	17
17	G	17-4	18-6	107	85	19
18	B	16-4	13-6	83	85	13
19	B	16-0	12-2	76	80	14
20	B	16-6	13-3	80	80	5
21	B	15-0	12-4	82	75	8
22	B	16-1	13-5	83	75	12
23	B	19-2	16-2	85	65	13
24	B	16-8	13-3	80	70	15
25	B	16-8	14-5	87	95	5
26	B	17-0	15-4	90	80	11
27	B	16-8	14-5	87	85	9
28	B	16-2	13-10	86	90	15
29	B	16-6	14-10	90	75	15
30	B	17-2	19-5	115	85	14
31	G	19-0	16-4	86	75	18
32	B	17-4	13-10	80	75	19
33	B	16-8	15-0	90	70	4
34	B	17-6	14-2	86	70	17
35	G	16-0	14-10	93	60	14

TABLE XIX (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
36	G	17-8	16-4	93	80	10
37	B	16-2	14-10	92	85	17
38	B	16-4	14-5	90	75	12
39	G	16-6	15-2	92	80	15
40	G	17-0	14-9	87	75	9
41	G	16-8	15-0	90	80	13
42	B	17-2	13-6	85	75	10
43	B	17-4	15-6	90	75	2
44	B	17-6	21-9	125	80	11
45	G	16-0	13-2	83	80	10
46	G	16-2	18-4	114	85	19
47	B	16-4	14-8	90	75	18
48	B	17-4	19-10	115	90	19
49	G	19-0	17-6	93	85	15
50	G	17-2	18-10	110	85	19
51	B	16-6	14-10	90	85	20
52	B	18-2	20-0	110	80	18
53	G	17-2	18-5	109	75	15
54	B	16-8	14-6	88	80	8
55	B	18-4	15-2	89	80	15
56	G	16-0	14-5	90	75	14
57	B	18-6	17-2	93	60	18
58	G	16-2	17-5	115	85	7
59	B	16-7	15-7	95	90	12
60	G	16-2	15-3	95	75	1
61	B	16-0	14-4	90	75	6
62	B	17-2	15-3	90	60	0
63	G	15-5	19-0	125	90	5
64	G	16-6	16-1	98	95	13
65	G	17-2	17-8	104	85	8
66	G	15-0	15-0	100	90	5
67	B	16-2	14-8	92	60	6
68	G	16-4	14-11	112	90	18
69	G	15-6	15-9	102	80	17
70	B	17-3	16-3	95	85	13

TABLE XIX (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
71	G	15-7	17-1	110	90	15
72	G	15-10	17-1	108	85	20
73	G	15-3	16-0	105	90	17
74	G	17-3	18-5	107	85	19
75	B	16-3	13-5	83	85	13
76	B	15-11	12-1	76	80	14
77	B	16-5	13-2	80	80	5
78	B	14-11	12-3	82	75	8
79	B	16-0	13-4	83	75	12
80	B	19-1	16-1	85	65	13
81	B	16-8	13-2	80	70	15
82	B	16-7	14-4	87	95	5
83	B	16-11	15-3	90	80	11
84	B	16-8	14-4	87	85	9
85	B	16-1	13-9	86	90	15
86	B	16-5	14-9	90	75	15
87	B	17-1	19-4	115	85	14
88	G	18-11	16-3	86	75	18
89	B	17-3	13-9	80	75	19
90	B	16-7	14-11	90	70	4
91	B	17-5	14-1	86	70	17
92	G	15-11	14-9	93	60	14
93	G	17-7	16-3	93	80	10
94	B	16-1	14-9	92	85	17
95	B	16-3	14-4	90	75	12
96	G	16-5	15-1	92	80	15
97	G	16-11	14-8	87	75	9
98	G	16-7	14-11	90	80	13
99	B	17-1	13-5	85	75	10
100	B	17-3	15-5	90	75	2

TABLE XX

SEX, C. A., M. A., I. Q., MATHEMATICS GRADE, AND NUMBER OF RIDDLES SOLVED CORRECTLY FOR 100 TWELFTH-GRADE PUPILS

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
1	B	16-4	20-2	105	85	5
2	B	18-2	20-10	115	80	7
3	G	16-2	18-6	115	95	17
4	G	17-6	21-6	125	95	18
5	G	16-7	16-0	102	90	14
6	B	17-0	15-6	91	85	12
7	B	17-2	19-3	112	80	21
8	B	17-4	15-7	90	85	18
9	B	17-6	15-8	89	85	20
10	B	17-8	16-0	91	80	15
11	B	16-6	14-10	90	90	21
12	B	18-4	16-8	91	80	17
13	B	17-10	16-1	90	85	18
14	B	17-0	15-6	91	80	21
15	B	16-8	14-11	90	85	22
16	B	17-2	22-6	134	90	24
17	B	17-4	15-7	90	85	18
18	B	17-6	15-10	90	85	18
19	B	16-10	18-6	110	75	20
20	B	16-2	14-6	90	80	20
21	B	18-2	14-8	81	70	4
22	B	17-8	18-4	104	85	15
23	B	17-4	15-5	89	80	18
24	B	17-6	16-11	97	90	9
25	B	17-8	16-11	96	80	11
26	B	18-2	17-9	98	75	18
27	B	17-2	15-5	90	75	11
28	B	17-4	15-11	92	85	14
29	G	16-6	14-10	90	75	14
30	B	18-0	21-7	120	90	24
31	B	17-2	19-2	112	85	18
32	G	17-0	15-11	94	60	17
33	G	17-0	15-6	91	85	15
34	G	17-3	15-10	92	55	8
35	G	17-2	15-5	90	75	17

TABLE XX (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
36	G	16-8	15-9	94	85	17
37	G	17-1	15-8	92	85	18
38	G	18-1	16-9	90	85	16
39	G	17-5	15-6	89	85	18
40	G	17-2	15-1	88	85	19
41	B	18-2	16-10	93	85	15
42	B	18-2	15-7	86	85	23
43	B	18-6	16-8	90	80	16
44	B	17-0	15-10	93	80	16
45	G	16-8	18-11	114	85	18
46	B	18-4	15-2	89	80	15
47	G	16-10	15-2	90	75	15
48	B	18-6	17-2	93	60	18
49	G	17-2	18-5	109	75	15
50	B	17-0	15-4	90	85	20
51	B	18-8	20-3	110	80	18
52	G	16-8	14-9	83	80	10
53	G	16-10	19-2	114	85	19
54	B	16-10	15-2	90	75	18
55	B	17-10	16-0	90	75	2
56	B	18-0	22-4	125	80	11
57	B	16-8	15-2	92	88	17
58	B	16-10	15-2	90	75	12
59	G	17-0	15-8	92	80	15
60	G	17-6	15-2	87	75	9
61	G	18-2	16-10	93	80	10
62	B	17-2	14-10	87	95	5
63	B	17-6	15-9	90	80	11
64	B	17-2	14-10	87	85	9
65	B	16-8	14-2	86	90	15
66	B	17-2	15-4	90	75	15
67	B	16-7	14-6	83	75	12
68	B	16-10	14-0	83	85	13
69	B	17-10	16-11	95	85	13
70	B	16-8	15-2	92	60	6

TABLE XX (Continued)

SUBJECT	SEX	C. A.	M. A.	I. Q.	MATHEMATICS GRADE	NUMBER OF RIDDLES SOLVED CORRECTLY
71	G	17-8	18-0	102	85	8
72	G	17-0	16-8	98	95	13
73	B	17-1	16-1	95	90	12
74	B	16-3	20-1	105	80	5
75	B	18-1	20-9	115	80	7
76	G	16-1	18-5	115	95	17
77	G	17-5	21-5	125	95	18
78	G	16-8	16-11	102	90	14
79	B	17-1	15-7	91	85	12
80	B	17-1	19-4	112	80	21
81	B	17-5	15-8	90	85	18
82	B	17-1	15-9	89	85	20
83	B	17-1	15-7	91	80	15
84	B	16-7	14-11	90	90	21
85	B	18-3	16-7	91	80	17
86	B	17-9	16-0	90	85	18
87	B	17-1	15-7	91	80	21
88	B	16-9	15-0	90	83	22
89	B	17-1	21-3	125	90	24
90	B	17-3	15-6	90	88	18
91	B	17-5	15-8	90	85	18
92	B	16-9	18-4	110	75	20
93	B	16-3	14-8	90	80	20
94	B	18-1	14-9	82	70	4
95	B	17-8	18-4	104	80	15
96	B	17-4	15-5	89	80	18
97	B	17-6	16-11	97	90	9
98	B	17-8	15-11	96	80	11
99	B	18-1	17-8	98	75	18
100	B	17-1	15-4	90	75	11

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The thesis "Riddle-Solving Ability and Intelligence," written by Jack Harry Landes, has been accepted by the Graduate School with reference to form, and by the readers whose names appear below with reference to content. It is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts

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